Questions matter

GCSE

Biology

8461/2F Paper 2 Foundation Tier

Report on the Examination

8461
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General comments

The standard of responses seen across the range of questions demonstrated a small drop in performance compared to last year. It was evident in responses when students had a good understanding of Required Practical Activities, and when they had not, as seen in the strong performance in question 06.4. Maths skills across the paper were of a reasonable standard.

It was common to see students miss out on gaining credit unnecessarily, due to paying insufficient attention to the information provided in the stem of a question which is designed to guide students to give a relevant response.

Some poor handwriting and faint ink made reading some students' responses problematic. Students are reminded that use of black ink is a requirement and are advised to ensure their pens deliver a dark black or their work may simply be indecipherable. Those with weak handwriting would have benefitted from additional support.

Students completing work on word processors are reminded not to use time copying out the questions as they are likely to run out of time to complete all questions. The same is true for questions requiring sentence completion – there is no requirement to copy out the full sentence.

There remains a large number of questions not being attempted. Students are encouraged to attempt all questions on the paper.

Levels of demand

Questions are set at two levels of demand for this paper:

- **Low demand** questions are designed to broadly target grades 1–3.
- **Standard demand** questions are designed to broadly target grades 4–5.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Questions 9, 10 and 11 are common with questions 1, 2 and 3 on the Higher Tier. These questions are identical with each other and are targeted at standard demand.

Question 1 (low demand)

01.1 Over 50% of students correctly completed the order of structures and gained two marks.

01.2 Almost 80% of students gained credit in this question, with the majority gaining full credit with very simple statements such as 'a fast reaction'. A common reason for not gaining credit was by giving an example of a reflex action rather than defining it.

01.3 95% of students knew that blinking in sudden bright light is an example of a reflex action.

01.4 Almost 95% of students knew that muscle is the type of tissue that causes movement.

01.5 Around two thirds of students correctly identified the pituitary gland.

01.6 Half of students correctly identified the cerebral cortex.

01.7 Almost 65% of students knew that balance is the function of the cerebellum.

Question 2 (low demand)

02.1 Almost 65% of students knew that balance is the function of the cerebellum.

02.2 A third of students were able to identify both classification groups that form the binomial name. However, a further 50% of students could identify at least one. It was common to see only one box ticked in this question; students are reminded to read the instructions given in the question carefully.

02.3 Almost 80% of students identified the correct time as 3 million years ago.

02.4 Just under two thirds of students gained this mark.

02.5 Almost half of students could give two possible causes of extinction, with a further one third of students able to give at least one. The most common causes given were predators and lack of food. A noticeable number of students failed to gain credit by only giving a vague statement about environment change.

02.6 25% of students could suggest a correct reason as to why wolves began to follow humans, with lots of vague statements about the similarities between wolves and humans in terms of what they ate and how they hunted.

02.7 Over half of students did not gain any credit on this question. Most commonly a student that gained one mark did so by describing the breeding of two less aggressive wolves but did not go further to describe breeding the offspring to achieve the second mark.

Question 3 (low demand)

03.1 A third of students gained this mark.

03.2 Over half of students correctly identified the antigen as the part of the virus made by the yeast cell. The most common incorrect answer seen was ‘nucleus’ or ‘gene’.

03.3 Two thirds of students knew a danger of this vaccine was that it may cause an infection.

03.4 10% of students did not score any marks on this question. The most common answers were sunlight and water, although minerals and space were also seen frequently. Some students gave oxygen as an answer but missed out on the mark when they didn't specify that the oxygen being competed for is that in the soil. The most frequent uncreditworthy answers were sun unqualified, food, nutrients, soil and carbon dioxide.

03.5 Less than 10% of students gained this mark. The vast majority of answers stated that the glyphosate kills the weeds but not the maize, or that this reduces competition without giving the consequence of this in terms of growth/yield.

03.6 A number of incorrect answers were given for this question, with just over 20% gaining the mark. Many students referred to the maize being killed, despite being told it was resistant and there were many vague comments about other organisms, or the environment being affected – which did not gain credit.

Question 4 (low and standard demand)

04.1 Over half of students correctly labelled both the optic nerve and the lens, with a further 40% labelling at least one of them correctly for a mark.

04.2 60% of students knew that to focus on a near object the ciliary muscles contract.

04.3 Just under 50% of students knew that the lens becomes thicker to focus on a near object.

04.4 One third of students knew that the size of the pupil is controlled by the iris, with the most common wrong answer being suspensory ligaments.

04.5 15% of students were able to achieve this mark, with many falling short by using poor terminology such as 'messages' or referring to 'signals' unqualified.

04.6 A little over 10% of students were able to articulate themselves clearly enough to gain the mark. All of the different options on the mark scheme were seen with some good descriptions given as to why the image would not be clear. Many students stated that the light rays had crossed without specifying where this has happened and fell short of the mark. Other students talked about the light rays not meeting, but at the wrong part of the eye such as the sclera or optic nerve so again did not gain the mark.

04.7 A well answered question with 75% of students gaining credit, mostly for referring to either 'laser eye surgery' (or simply just 'surgery') or to contact lenses.

Question 5 (low and standard demand)

05.1 The majority of students knew that the pancreas produced insulin, with over 80% of students gaining the mark.

05.2 Half of students gained this mark showing an understanding that the body cells take in a low amount of glucose from the blood, in a person with Type 2 diabetes.

05.3 Students were presented with a method for an investigation and asked to identify two control variables. Three quarters of students were able to identify at least one control variable and many of those gained full marks. Common errors included being too vague; answers such as 'glucose' or 'water' were not credited. A significant number of students have an understanding about what a control variable is.

05.4 Almost 60% of students gained both available marks in this calculation, with the rest largely scoring zero. A number of students gave an answer of 8 or 12 without working which, despite being within the acceptable range, was not creditworthy without evidence of which numbers had been used to reach the answer.

05.5 Many students struggled with this question, with just under a quarter of students managing to gain any marks. Whilst many spotted the lower concentration, few described the idea of it being lower throughout the investigation. Many did not clearly read the instructions which told them not to refer to when the maximum value occurred. Several students often chose the wrong words to describe an idea, such as using 'steady' or 'gradual', which do not mean the same as slower.

05.6 Over three quarters of students correctly identified that using different concentrations of drug X would enable scientists to find the best dose.

Question 6 (low and standard demand)

06.1 Just under 50% of students could name a plant's growth response as a tropism.

06.2 60% of students knew that auxin is the substance that controls the response to light in plant shoots.

06.3 Around 40% of students could identify two substances that are absorbed by roots, with a further 50% identifying at least one substance. It was common to see only one box ticked in this question; students are reminded to read the instructions given in the question carefully.

06.4 This was an extended response question involving 3 marking levels. It was clear that many students had an understanding of the Required Practical Activity on tropisms assessed in this question. Almost 40% of students reached Level 3, with the majority of those gaining full marks. Those that did, successfully described investigating at least 2 light regimes as well as measuring/observing results and giving a control variable.

Descriptions of measurement/observation were often vague, but the idea of seeing how much the seedlings had grown after a period of time was considered enough of an implication that measurements must have been taken.

Question 7 (low and standard demand)

07.1 Just over 40% of students knew that the gardener included a control in the investigation to allow a comparison to be made or to show the effect of chemical Q.

07.2 Students were asked to calculate how many times more concentrated chemical Q was in tube 6 than in tube 2. 60% of students correctly completed the calculation and scored two marks. Most common errors were doing a subtraction or counting the number of places that the decimal point needed to move so ending up with an answer of 4.

07.3 90% of students correctly identified 0.1 arbitrary units as the best concentration for root growth.

07.4 There were many good answers seen, with 60% of students gaining the mark – most by giving a specific example in terms of no growth in tube 6. Those that missed the mark often did so by saying that 'as the concentration increased fewer roots grew' which is not correct, without indicating this occurred after tube 3.

07.5 This was an extended response question involving two levels. 15% of student responses accessed Level 2 with the majority falling into Level 1. Students needed to link ideas to access Level 2, and while there were many attempts at linking seen, often the outcome was vague and not clearly relating to the question which was about cuttings.

Students are reminded to read the question carefully and ensure their response is in the correct context. Many of those who gained marks realised that using cuttings would lead to identical offspring being produced but did not link this to a creditworthy explanation of how this came about; there were very few responses regarding genetic variation and almost none about meiosis or mitosis.

Question 8 (low and standard demand)

08.1 Half of students correctly interpreted the information given in the question and correctly used the given symbols to write the required genotype of 'rr'. Very occasionally the written terms of 'homozygous recessive' were seen, which was credited.

Some students gave only 'recessive' or only 'homozygous' which were insufficient in isolation.

08.2 Almost 50% of students gained all three marks for a correct Punnett square. Plenty of correct Punnett squares seen with some going on to also give the correct ratio. The most common mistake was using 'RR' for the male (although rr was also seen). Marking points 2 and 3 could still be gained for correct derivation of the offspring genotypes.

Some students incorrectly gave 2 alleles for the male gametes and/or 1 for each offspring. There were quite a lot of students who overwrote the letters or drew additional Punnett squares. In some cases, it was very difficult to determine which one they intended as their final answer. Students should be encouraged to cross out an incorrect answer and write another beside it if they change their mind.

08.3 35% of students were able to give the correct ratio from their Punnett square in question 08.2. Many students did not realise that the offspring would all be round so gave an incorrect ratio of 1:1, 2:2 or even 50:50. Credit was still given if a sensible assumption could be made about the phenotype of offspring from incorrect Punnett squares using single alleles for the offspring, or even two alleles for the parent genotypes.

08.4 This question was not answered well and almost 20% of students did not attempt to answer it. Some students showed an understanding that there was some sort of difference, however, many found it different to express. Those that had a clear understanding often wrote the answer 'two different alleles', but others became confused and described different genes/chromosomes/parents, or that it was related to being female, none of which was creditworthy. Just under 20% of students gained this mark.

08.5 Fewer than 10% of students gained full marks in this question, with just over 35% gaining one mark. The question was well attempted, but many student responses were vague and did not quite reach the clarity necessary for credit. The most common reasons given for why Mendel's work had not being recognised was 'he was not believed' and 'not enough evidence'. Quite a few students referred to 'technology having not advanced at the time' which did not answer the question and was too vague for credit. Some pupils referred to scientific terms or discoveries that did not relate to the time period and thus could not be credited. A few said that Mendel was 'only a monk' or 'not a scientist' which earned them the mark. The other bullet points on the mark scheme were seen less frequently.

Question 9 (standard demand)

09.1 Students struggled to articulate their answer to this question with 20% of students defining a mutation correctly. Many students knew that it was something to do with 'a change', but this was anything from a cell or a particular characteristic of a phenotype to a whole species changing.

09.2 Fewer than 5% of students were able to give a full description of natural selection to gain full marks. 20% of students did not attempt the question at all, and a further 50% of students failed to gain any marks. Very few students talked about variation for the first mark. Survival of the fittest was not well described but some picked up the mark by using the phrase. The third bullet point was most often awarded for the implication that those that survived went on to breed, and this may have been by mentioning 'offspring' in marking point 4. Vague references to 'traits' or 'characteristics' being passed on were not creditworthy in bullet point four. Students who were able to give an example of natural selection had better structures to their answers, with giraffe necks being the most common example given.

09.3 Just over 50% of students were able to identify Alfred Wallace and Alexander Fleming as the scientists that suggested the theory of evolution by natural selection.

09.4 Over 50% of students managed to gain a mark in this question, most commonly for stating 'the hoverfly looks like the wasp'. Marking point 2 was rarely awarded as students failed to explicitly refer to the wasp. Some incorrect answers referred to the hoverfly's colours enabling it to camouflage which did not gain credit. Overall, the main reason marks were not awarded was because of vagueness, or poor articulation of ideas.

Question 10 (standard demand)

10.1 Some students appeared to be confused as to how decay happens, believing that the dead plant matter would decay itself. However, around 10% of students did indicate that some sort of microorganism is involved in the decay process, gaining the third mark in the mark scheme. Some students spent time unnecessarily describing the factors needed for decay and often needed to extend their answers onto the additional pages.

There were two routes students could use to gain marks. Many students' answers included elements of both routes, so examiners awarded marks for the described route which gave the higher mark. In most cases this was the first route given in the mark scheme.

The information in the question told students that layer B contains 'very little oxygen' and 'has a low pH'; thus, simply repeating either of these was insufficient to gain credit. To gain the first mark, students needed to link one of these pieces of information to their own knowledge: either in terms of respiration or in terms of enzymes being denatured or reducing in activity. Many students also gained this first marking point, although some who took the second route demonstrated confusion about what a 'low pH' constitutes, describing it as 'low acidity' or 'being 'alkaline'.

Achieving marking point 2 proved to be more problematic for many students. Most simply by omitting any reference to energy or metabolism. Students should be advised that when referring to respiration in their answers (as many did), they should then go on to describe the role of respiration: 'releasing energy'. For those who did refer to energy, it was noted that very few described energy being 'produced', which is never acceptable as this would contradict the principle of conservation of energy.

10.2 40% of students identified the correct answer regarding the approximate biomass of moss that becomes biomass in primary consumers.

10.3 Fewer than a tenth of students identified DNA as a substance that can be made using phosphates.

10.4 Around 20% of students could identify protein as the substance that can be made using nitrogen.

10.5 Almost 65% of students gained at least one mark in this question, and a quarter of those gained three of the four available marks. A number of students described a rise in temperature of the Earth's atmosphere, gaining marking point 1.

It should be noted that the 'greenhouse effect' and 'climate change' are not equivalent to 'global warming'. A significant number of students attempted to describe the mechanism of global warming. This was often confused, including references to the 'ozone layer' and incorrect descriptions of long and short-wave radiation. However, such descriptions are beyond the requirements of the specification, so were ignored.

Students who merely repeated the information that the peat bog 'contains' carbon dioxide and methane could not be awarded marking points 2 or 4. Instead further added value was required, in that these gases would be 'released' from the peat when the bog was destroyed. A significant number of students omitted any reference to methane, so were unable to gain marking point 4.

Again, students should be advised that repeating the information in the question will not gain credit, thus those that described 'the use of peat as a fuel' releasing carbon dioxide. To gain credit here, students needed to indicate that the peat would have to be 'burned' to produce carbon dioxide. In this case, examiners ignored the idea that burning would also release (trapped) methane, as this would inevitably also be burned, releasing more carbon dioxide.

Question 11 (standard demand)

11.1 Just under 40% of students successfully identified an improvement to the method. The most common creditworthy responses were 'repeats', 'collect more water' or a description of avoiding double counting of the tadpoles. As the experimental time frame given was 8 weeks, improvements that suggested extending this time period were not given credit.

11.2 Almost 80% of students correctly carried out the simple calculation. Students using the row rather than the column was the main reason to not score marks.

11.3 Students were asked to complete a graph to show how the total number of tadpoles changed over the 8-week period. Almost 50% of students scored three or more marks, with a marks commonly not achieved for either not labelling the *x*-axis or failing to use a linear scale.

Plotting the points was mostly done well and students that did miss out on these marks was due to accuracy as each small square vertically was 2 units. The line of best fit should have been a smooth curve through the points, but many students used a ruler to draw a straight line of best fit or simply joined the plots dot-to-dot – neither of which were correct. 15% of students did not attempt this question.

11.4 Students are asked to calculate the percentage of the tadpoles that would still be found in the pond at four weeks compared to zero weeks using the data from their graph. 25% of students did not attempt this calculation. Many students achieved marking point 1 only for using the values from their graph at 0 and 4 weeks. They could not then use the values correctly to determine the answer.

A common incorrect approach was to take the answer for 4 weeks away from 60 before multiplying by 100. A noticeable number of students chose not to use their graph but instead used data from the table, allowing some credit to be given as long as the values from the table were correct.

11.5 Almost one third of students gained full marks in this question for correctly suggesting two reasons why the tadpoles died. The most common correct answers were 'not enough food', and then reference to predators or disease. The most common uncreditworthy responses seen were vague references to changes in environment/conditions, lack of parental care and natural selection. Effects of the experimental method were ignored.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.